

NUCLEAR PHYSICS

Impacting the lives of everyday Americans



Medical diagnostics are made possible by nuclear physics technologies.

The nuclear sciences provide tools and highly trained individuals who are vital to medicine, industry, energy and national security.

In the century since its inception, basic nuclear physics research has had far-reaching impacts on the lives of everyday Americans. The field has spurred the development of unique technologies, techniques and expertise that have benefitted such diverse applications as medical diagnostics and treatments to food safety to nuclear monitoring and deterrence.

The technical innovations and knowledge fueled by basic research in nuclear physics has enabled and continues to yield ever-more societal and economic benefits.

MEDICINE

Nuclear physics technologies lie at the

root of many of today's most advanced medical diagnostic procedures and treatments. Daily, more than 40,000 patients receive procedures made possible by nuclear physics advancements.

Particle accelerators and particle detection technologies, first developed to study the heart of matter, are now used to benefit the human heart and other vital internal organs. Over 50 medical isotopes, most of which were first characterized by researchers, have been artificially produced by particle accelerators and used in internal imaging of the human body. Other particle accelerators take a more active role, generating particle beams that eradicate cancers.

Still others ensure that medical equipment is safe, efficiently sterilizing bandages, syringes and surgical tools.

In the imaging suite, particle detection technologies developed for research are now used to reveal disease and injury in the human body. Many diagnostic techniques, from MRI to PET to CT scans, owe their existence to nuclear physics.

INDUSTRY AND ENERGY

From smoke detectors to oil and natural gas wells, technologies developed for nuclear science are applied in the industrial setting to improve consumer products, ensure efficient energy production and exploration, and improve building and manufacturing.

Isotopes discovered by nuclear physicists and produced with particle accelerators are used in a wide range of industrial applications, including improving smoke detectors, oil exploration, manufacturing integrity scans and sterilization of components. Particle accelerators enable “well logging” by oil and natural gas companies, which is a quick test of the



Particle accelerators enable quick tests of oil and natural gas drilling sites.

Nuclear power currently provides nearly 20% of U.S. electric power. The highly skilled workforce needed to keep nuclear power generation plants operating efficiently and safely often come from the nuclear science community.

NATIONAL SECURITY

Sensitive detectors and particle accelerator techniques and tools also enable the U.S. to safeguard its borders, monitor nuclear weapon activity and protect our citizens traveling by air.

Cargo-scanning technologies deployed at borders and throughout the country screen containers for unauthorized materials, sensitive

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production potential of drill sites. They also enable efficient electron-beam welding of materials and eliminate pathogens in and extend the shelf-life of certain foods.

detectors sniff for components that are produced by materials used to make bombs, and passengers and luggage are quickly scanned and cleared at airports with techniques originating in nuclear science.



The nuclear sciences train next-generation experts in a variety of STEM fields.

STEM WORKFORCE

A ream of related disciplines support the nuclear science mission, including nuclear physicists, accelerator scientists, computer scientists and engineers. Many students who begin their advanced studies and training in support of nuclear physics research eventually go on to contribute in other fields enabled by nuclear science.

This highly trained nuclear science workforce provides qualified individuals that are vital to medicine, industry and U.S. energy and national security.

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